

WHAT IS CLAIMED IS:

1 1. A formation fluid sample bottle comprising:
2 a cylindrical tube with an enclosed top end and an open bottom end;
3 a sample piston slidably inserted into said cylindrical tube to form a
4 sample chamber inside said cylindrical tube between said enclosed top end and said
5 sample piston;
6 a charging piston slidably inserted into said cylindrical tube between
7 said sample piston and said open bottom end to form a pressurized gas chamber
8 inside said cylindrical tube between said sample piston and said charging piston; and
9 an end cap fixed to said open bottom end;
10 wherein:
11 said charging piston includes a valve to allow the introduction of a
12 pressurizing gas into said pressurized gas chamber.

1 2. The formation fluid sample bottle of claim 1, wherein said enclosed
2 top end includes an opening with a valve to allow a formation fluid sample to be
3 introduced into said sample chamber.

1 3. The formation fluid sample bottle of claim 2, wherein said end cap
2 includes an open port.

1 4. The formation fluid sample bottle of claim 3, wherein said charging
2 piston has an outer circumference and additionally comprises:
3 at least one O-ring located at said outer circumference;
4 an axial bore extending through said charging piston; and
5 a check valve positioned in said axial bore.

1 5. The formation fluid sample bottle of claim 4, wherein said charging
2 piston additionally comprises a plunger inserted into said axial bore.

1 6. The formation fluid sample bottle of claim 5, wherein said plunger
2 additionally comprises:
3 a distal end and a proximal end;

4 an axial bore;
5 a narrowed diameter section at said distal end; and
6 a release plug inserted into said axial bore at said proximal end.

1 7. The formation fluid sample bottle of claim 6, wherein:
2 said plunger additionally has an outer circumference and further
3 comprises:
4 at least one O-ring located at said outer circumference; and
5 said outer circumference of said plunger is provided with threads for
6 attachment to said axial bore of said charging piston.

1 8. The formation fluid sample bottle of claim 7, additionally comprising
2 pressurized nitrogen gas inserted into said pressurized gas chamber.

1 9. The formation fluid sample bottle of claim 8, wherein said charging
2 piston is formed from material selected from the group consisting of alloy steel,
3 stainless steel and corrosion resistant alloy metal.

1 10. A single phase formation evaluation tool comprising:
2 at least one formation fluid sample bottle with an enclosed top end,
3 an open bottom end and an axial bore extending through said formation fluid sample
4 bottle;
5 a sample piston slidably inserted into said axial bore of said
6 formation fluid sample bottle to form a collection chamber within said axial bore,
7 between said enclosed top end and said sample piston;
8 a charging piston slidably inserted into said axial bore of said
9 formation fluid sample bottle below said sample piston, to form a pressurized gas
10 chamber within said axial bore, between said sample piston and said charging
11 piston; and
12 an end cap fixed to said open bottom end of said formation fluid
13 sample bottle.

1 11. The single phase formation evaluation tool of claim 10, wherein said
2 charging piston has an outer circumference and additionally comprises:
3 at least one O-ring located at said circumference;
4 an axial bore extending through said charging piston; and
5 a check valve positioned in said axial bore.

1 12. The single phase formation evaluation tool of claim 11, wherein said
2 charging piston additionally comprises a plunger inserted into said axial bore.

1 13. The single phase formation evaluation tool of claim 12, wherein said
2 plunger additionally comprises:
3 a distal end and a proximal end;
4 an axial bore;
5 a narrowed diameter section at said distal end; and
6 a release plug inserted into said axial bore at said proximal end.

1 14. The single phase formation evaluation tool of claim 13, wherein:
2 said plunger additionally has an outer circumference and further
3 comprises:
4 at least one O-ring located at said outer circumference; and
5 said outer circumference of said plunger is provided with threads for
6 attachment to said axial bore of said piston.

1 15. The single phase formation evaluation tool of claim 14, additionally
2 comprising pressurized nitrogen gas inserted into said pressurized gas chamber.

1 16. The single phase formation evaluation tool of claim 15, wherein said
2 charging piston is formed from material selected from the group consisting of alloy
3 steel, stainless steel and corrosion resistant alloy metal.

1 17. The single phase formation evaluation tool of claim 10, additionally
2 comprising:

3 a case adaptor positioned at said open bottom end of said formation
4 fluid sample bottle; and

5 wherein said end cap is fixed to said case adapter.

1 18. The single phase formation evaluation tool of claim 17, additionally
2 comprising anti-rotation lugs mounted on said case adaptor to engage said charging
3 piston.

1 19. The single phase formation evaluation tool of claim 10, wherein said
2 charging piston includes a check valve to introduce pressurized gas into said
3 pressurized gas chamber.

1 20. A pressurizing piston for use in collecting formation fluid samples
2 downhole and maintaining the pressure of the sample above the bubble point of the
3 sample, comprising:

4 a cylindrical main body with a distal end, a proximal end and a
5 threaded axial bore;

6 a check valve inserted into said axial bore at said distal end of said
7 main body;

8 a plunger with a narrowed diameter distal section, an open proximal
9 end, an axial bore, an outer circumference with at least one O-ring located at said
10 outer circumference, and threads located on said outer circumference engaged to
11 said cylindrical main body threaded axial bore; and

12 a release plug inserted into said plunger open proximal end to seal off
13 said plunger axial bore.

1 21. A method for downhole fluid sample collection comprising the steps
2 of:

3 providing a tube with a first end and a second end, and a first piston
4 and a second piston located within said tube;

5 inserting pressurized gas in the space between said first and second
6 piston;
7 lowering the tube downhole;
8 collecting a formation fluid sample in the space between the first end
9 of the tube and said first piston;
10 raising said tube with said formation fluid sample.

1 22. A method for extracting a single phase fluid sample from a wellbore
2 formation and maintaining the sample in a single phase, comprising the steps of:
3 forcing a sample piston and a charging piston together within a
4 formation fluid sample bottle to purge any existing gas from a pressurized gas
5 chamber;
6 attaching a pressurized gas source to said charging piston;
7 forcing pressurized gas through said charging piston into said
8 pressurized gas chamber;
9 removing said pressurized gas source from said charging piston.
10 inserting said formation fluid sample bottle into a formation
11 evaluation tool;
12 lowering said formation evaluation tool into a wellbore to a desired
13 formation depth;
14 allowing hydrostatic pressure from said wellbore to force said
15 charging piston toward said sample piston to further pressurize said pressurized gas;
16 pumping formation fluid into said single phase collection apparatus;
17 raising said formation evaluation tool; and
18 removing said single phase collection apparatus from said formation
19 evaluation tool.